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ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT KENTUCKY 40601
www.kentucky.gov

January 24, 2011

Benton Hanson, P.E, Project Manager
HDR Engineering, Inc
2517 Sir Barton Way
Lexington, KY 40509

RE: City of Flemingsburg
AI # 11592
New Flemingsburg WWTP

Dear Mr. Hanson:

Thank you for submitting a Green Project Reserve (GPR) business case for your proposed project, funded through the Clean Water State Revolving Fund (CWSRF). A provision of the 2011, CWSRF funding cycle requires that to the extent there are eligible project applications; states shall use 20% of its Clean Water State Revolving Fund capitalization grant for green infrastructure projects. These projects are intended to address water and energy efficiency improvements or other environmentally innovative activities. The Kentucky Division of Water (KY DOW) has reviewed the GPR business case for the Flemingsburg New WWTP project, and has found the justification to be acceptable. If the scope of the project is altered in any way to exclude the GPR eligible components, the City of Flemingsburg shall submit the changes in writing to the KY DOW and receive prior approval in writing before proceeding with construction.

We look forward to working with you in finalizing your wastewater infrastructure project. If you have any questions regarding this correspondence, please contact me at (502) 564-3410, ext 4832.

Sincerely,

Greg Goode, P.E.
Kentucky Division of Water

Cc: City of Flemingsburg
CWSRF File

GREEN COMPONENT SUPPLEMENT TO THE 2011 CWSRF AND DWSRF CALL FOR PROJECTS

During the 2011 Call for Projects held October 2009 through March 2010, the below referenced project was identified as "green" or included "green" components. In order to determine the green costs and whether or not the project is considered categorically green or whether a business case will be required, the Division of Water needs additional information.

Attached to this email is the current Green Guidance for the 2011 funding cycle. Green projects are classified as projects that address: Water Efficiency, Energy Efficiency, Green Infrastructure or Environmentally Innovative Activities. The guidance discusses each of these categories and the components or types of projects that would require a business case versus a classification of categorically green.

Please review the attached guidance and complete the below information. **In order for green merits of the project to be included as such on the 2011 Priority List, this form must be completed and returned via email to Division of Water no later than May 17, 2010.** Questions or completed forms should be submitted to the Division of Water contacts noted below:

Clean Water SRF	Drinking Water SRF
Anshu Singh	Amanda Yeary
Anshu.singh@ky.gov	Amanda.yeary@ky.gov
502-564-3410 ext. 4805	502-564-3410 ext. 4839

Note: An itemized list of components and their related costs are all that is required at this time.

Applicant (Must be governmental entity): City of Flemingsburg

Project Name: Flemingsburg Wastewater Treatment Plant

WX / SX Number (required): SX-21069003

Please provide contact information for questions relating to this form only:

Contact Name: Benton Hanson, P.E.
Email: benton.hanson@hdrinc.com
Telephone: 859-223-3755

1) Based on the attached guidance, do you consider your project a 100% green project?

Yes _____ No ✓

2) Based on the attached guidance, please categorize your green components into the identified categories and provide a listing of the green components and an estimation of related costs at this time:

a. Water Efficiency $ 0 (total)

Breakdown of components included with related costs:

Component	Cost

b. Energy Efficiency $ 1,680,000 (total)

Breakdown of components included with related costs:

Component	Cost
SBR EQUIPMENT/STRUCTURE	1,650,000
INFLUENT PUMP STATION (PUMPS WITH VFD'S)	30,000

c. Green Infrastructure $ 0 (total)

Breakdown of components included with related costs:

Component	Cost

d. Environmentally Innovative Activities

Breakdown of components included with related costs:

Component	Cost
UV DISINFECTION SYSTEM	230,000

3) Total Project Cost related to "green" components (all categories): $ 1,910,000

Clean Water State Revolving Fund
Green Project Reserve Eligible Project Components
Categorically/Business Case

January 2011

City of Flemingsburg, Kentucky
New Wastewater Treatment Plant
SRF No. L_____

Prepared for:

City of Flemingsburg
140 West Electric Avenue
P.O. Box 146
Flemingsburg, Kentucky 41041

Prepared by:

HDR Engineering, Inc.
2517 Sir Barton Way
Lexington, Kentucky 40509
(859) 223-3755

Clean Water State Revolving Fund
Green Project Reserve Eligible Project Components
City of Flemingsburg, Kentucky

Background

The City of Flemingsburg intends to construct a new wastewater treatment plant (WWTP). The treatment process being installed is a sequencing batch reactor (SBR) extended aeration activated sludge process with ultraviolet (UV) light disinfection. The design of the project will begin in the Spring of 2011. The construction cost for the project is $7,125,000.

This document is prepared by HDR Engineering, Inc. (HDR) for the City of Flemingsburg. Design of the new WWTP will be completed by HDR. Questions regarding this document should be directed to the following contact person:

P. Benton Hanson, P.E.
Project Manager
HDR Engineering, Inc.
2517 Sir Barton Way
Lexington, Kentucky 40509
(859) 223-3755
benton.handon@hdrinc.com

The purpose of this document is to identify components for the referenced project that may be eligible for the Green Project Reserve for the Clean Water State Revolving Fund Loan. The components identified and described in the report include:

Category 3 - Energy Efficiency:

- Item 3.1 – SBR Equipment and Structure with Variable Frequency Drives (VFDs).
- Item 3.2 – Influent Pump Station with VFDs.

Category 4 – Environmentally Innovative:

- Item 4.1 – Ultraviolet (UV) Light Disinfection

Each of the items listed above will be discussed as follows.

Category 3 – Energy Efficiency

Item 3.1 SBR Equipment and Structures with Variable Frequency Drives

The components of the project eligible as a **Categorical Project** under Energy Efficiency (see 3.2-2 "Projects that achieve a 20% reduction in energy consumption are categorically eligible" in Page A of CWSRF GPR SRF Programs). The WWTP will be rated at 1.13 million gallons per day (MGD). It is assumed that the average flow through the WWTP will be 0.56 MGD or about 50 percent of the WWTP's rated capacity. The SBR equipment and associated structures will separate the electrical equipment of the aeration system from the mixing components allowing the best efficient use of power along with VFDs per actual flow treated. The aeration system equipment will include three 100 horsepower (HP) blowers. The mixing components will include two 30 HP mixers.

The estimated cost for the SBR equipment and structures is $1,680,000.

Item 3.2 Influent Pump Station with VFDs

The influent pump station will include two 10 HP pumps having a capacity of 300 gallons per minutes (gpm) each, and two 40 HP pumps having a capacity of 2,500 gpm each or 3.6 MGD (peak flow capacity of the WWTP). VFD operation will allow the pumps to operate at a reduced speed, matching influent flow rates.

The estimated cost for the VFDs is $30,000.

Category 4 – Environmentally Innovative

Item 4.1 Ultraviolet (UV) Light Disinfection

The component of the project falls under the Environmentally Innovative Category (see 4.5-5 "Application of innovative treatment technologies or systems that improve environmental conditions and are consistent with the Decision Criteria for environmentally innovative projects such as: 4.5-5a projects that significantly reduce or eliminate the use of chemicals in wastewater treatment" in Part A of CWSRF GPR SRF Programs). The process will enhance the level of disinfection of the wastewater without the need for any addition of chemicals such as chlorine and sulfur dioxide. The process will be UV light to disinfect the WWTP effluent discharge.

The estimated cost for the UV light disinfection is $230,000.

Results

The following unit cost was determined to estimate the savings from energy efficiency measurements.

- The power cost will be based on an assumed kilowatt hour cost of $0.07.

Item 3.1 – SBR Equipment and Structures with Variable Frequency Drives (VFDs)

Based on an average daily flow of 0.56 MGD, the SBR treatment system will produce annual energy consumption and cost savings as follows.

The SBR treatment system energy consumption will be based on the following assumptions:

- KVA = $\sqrt{3}(V)(A)$
- KW = KVA (PF)
- Electrical Cost = [√3(V)(A)/1,000](PF)(# of units)(operational time per year)(electrical cost)
- Two 100 HP blowers operating 10.6 hours each per day
- Two 30 HP mixers operating 12 hours each per day
- Blowers operating with VFDs operate at a reduced speed equivalent to a 64 HP motor (72 amps)
- Mixers operating without VFDs, therefore the amp draw is equal to 35 amps

KVA = 1,000 volt-amps
V = volts, 460V
A = amps (full load amps)
KW = Kilowatts
PF = Power Factor

Electrical Cost (Blowers) = [√3(460)(72)/1,000](0.80)(2)(10.6)(365)($0.07
= $24,858/yr.

Electrical Cost (Mixers) = [√3(460)(35)/1,000](0.86)(2)(12)(365)($0.07)
= $14,706/yr.

Total Electrical Cost = $39,564/yr.

An equivalent alternate treatment system energy consumption will be based on the following assumptions:

- KVA = √3(V)(A)
- KW = KVA(PF)

- Electrical Cost = [√3(V)(A)/1,000](PF)(# of units)(operational time per year)(electrical cost)
- Two 75 HP Aerators operating 24 hours each per day.
- Aerators operating with VFDs operate at a reduced speed equivalent to a 50 HP motor (61 amps)

Electrical Cost (Aerators) = [√3(460)(61)/1,000](0.80)(2)(24)(365)($0.07)
= $47,684/yr.

Energy Consumption Savings = [47,684 – 39,564/39,564](100) = 20.5%

Item 3.2 – Influent Pump Station with VFDs

Based on an average daily flow of 0.56 MGD and a peak flow of 3.6 MGD during rainfall periods, the influent pumping system with VFDs will produce annual energy consumption and cost savings as follows.

The influent pump station energy consumption with VFDs will be based on the following assumptions:

- KVA = $\sqrt{3}(V)(A)$
- KW = KVA (PF)
- Electrical Cost = [√3(V)(A)/1,000](PF)(# of units)(operational time per year)(electrical cost)
- Two 10 HP pumps operating 12 hours each per day
- One 40 HP pump operating 6 days per month, 6 hours each operation
- 10 HP pump operating with VFDs operate at a reduced speed equivalent to a 7.5 HP motor (9 amps)
- 40 HP pump operating with VFDs operate at a reduced speed equivalent to a 25 HP motor (25 amps)

KVA = 1,000 volt-amps
V = volts, 460V
A = amps (full load amps)
KW = Kilowatts
PF = Power Factor

Electrical Cost (10 HP Pump) = [√3(460)(9)/1,000](0.95)(2)(12)(365)($0.07)
= $4,177/yr.

Electrical Cost (40 HP Pump) = [√3(460)(25)/1,000](0.93)(6)(6)(12)(365)($0.07)
= $560/yr.

Total Electrical Cost = $4,737/yr.

The influent pump station energy consumption based on constant speed drives will be based on the following assumptions:

- KVA = $\sqrt{3}(V)(A)$
- KW = KVA (PF)
- Electrical Cost = [√3(V)(A)/1,000](PF)(# of units)(operational time per year)(electrical cost)
- Two 10 HP pumps operating 10 hours each per day
- One 40 HP pump operating 6 days per month, 4 hours each operation
- 10 HP pump operating at constant speed has an amp draw equal to 13 amps
- 40 HP pump operating at constant speed has an amp draw equal to 48 amps

KVA = 1,000 volt-amps
V = volts, 460V
A = amps (full load amps)
KW = Kilowatts
PF = Power Factor

Electrical Cost (10 HP Pump) = [√3(460)(13)/1,000](0.95)(2)(10)(365)($0.07)
= $5,028/yr.

Electrical Cost (40 HP Pump) = [√3(460)(48)/1,000](0.93)(4)(6)(12)($0.07)
= $717/yr.

Total Electrical Cost = $5,745/yr.

Energy Consumption Savings = [5,745 – 4,737/4,737](100) = 21.3%

Item 4.1 – Ultraviolet (UV) Light Disinfection

The process will enhance the level of disinfection without the need for any addition of chemicals such as chlorine or sulfur dioxide. The process uses UV light for disinfection. Treatment with UV light is a physical process that has not been found to produce undesirable byproducts associated with disinfectants.

The cost of UV light equipment is $230,000.

Summary and Conclusions

By construction of the SBR treatment system and installing VFDs on the blowers and mixers, and the influent pumps, the estimated yearly electrical cost savings is $8,120 ($47,684 - $39,564) or 20.5 percent for the SBR treatment system and $1,008 ($5,745 - $4,737) or 21.3 percent for the influent pumps for a total yearly electrical savings of $9,128. Of the total construction cost of $7,125,000, a total of $1,940,000 ($1,680,000 + $30,000 + $230,000) meet the requirements for the Green Project Reserve.